UL TEST REPORT AND PROCEDURE

Standard:	UL 62368-1, 3rd Ed, 2021-10-22 (Audio/video, information and communication technology equipment Part 1: Safety requirements) CAN/CSA C22.2 No. 62368-1:19, 3rd Ed, 2021-10-22 (Audio/video, information and communication technology equipment Part 1: Safety requirements)
Certification Type:	Component Recognition
CCN:	QQJQ2, QQJQ8 (Power Supplies for Use in Audio/Video, Information and Communication Technology Equipment)
Complementary CCN:	N/A
Product:	Modular Power Converter
Model:	Alpha 400, Alpha 400W, MA400, CA400, Alpha-400, Alpha-400W, MA-400, CA-400 Alpha 600, CA600, Alpha 600W, Alpha-600, CA-600 Alpha 800, Alpha 800W, CA800 Alpha 1000, Alpha 1000W, CA1000 Alpha 1500, Alpha 1500W, CA1500
Rating:	Alpha 400, Alpha 400W, MA400, CA400, Alpha-400, Alpha-400W, MA-400, CA-400: 100 – 240Vac nominal, 7A max, 47-63Hz Alpha 600, CA600, Alpha 600W, Alpha-600, CA-600: 100 - 240Vac or 177-326Vdc nominal. 47-63Hz, 10Aac or 6Adc Alpha 800, Alpha 800W, CA800, Alpha 1000, Alpha 1000W, CA1000: 94.5 - 240Vac nominal, 133-328Vdc nominal,16Aac, 11Adc, 47-63Hz Alpha 1500, Alpha 1500W, CA1500: 94.4-240Vac nominal, 16A Max, 47-63 Hz
Applicant Name and Address:	TDK-LAMBDA UK LTD KINGSLEY AVE ILFRACOMBE EX34 8ES UNITED KINGDOM

This is to certify that representative samples of the products covered by this Test Report have been investigated in accordance with the above referenced Standards. The products have been found to comply with the requirements covering the category and the products are judged to be eligible for Follow-Up Service under the indicated Test Procedure. The manufacturer is authorized to use the UL Mark on such products which comply with this Test Report and any other applicable requirements of UL LLC ('UL') in accordance with the Follow-Up Service Agreement. Only those products which properly bear the UL Mark are considered as being covered by UL's Follow-Up Service under the indicated Test Procedure.

The applicant is authorized to reproduce the referenced Test Report provided it is reproduced in its entirety.

UL authorizes the applicant to reproduce the latest pages of the referenced Test Report consisting of the first page of the Specific Technical Criteria through to the end of the Conditions of Acceptability.

Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL.

Prepared By:	Hubert Koszewski / Project Handler	Reviewed By:	Jan J. Jensen / Reviewer

Supporting Documentation

The following documents located at the beginning of this Procedure supplement the requirements of this Test Report:

A. Authorization - The Authorization page may include additional Factory Identification Code markings.

B. Generic Inspection Instructions -

i. Part AC details important information which may be applicable to products covered by this Procedure. Products described in this Test Report must comply with any applicable items listed unless otherwise stated in the body of this Test Report.

ii. Part AE details any requirements which may be applicable to all products covered by this Procedure. Products described in this Test Report must comply with any applicable items listed unless otherwise stated in the body of each Test Report.

iii. Part AF details the requirements for the UL Certification Mark which is not controlled by the technical standard used to investigate these products. Products are permitted to bear only the Certification Mark(s) corresponding to the countries for which it is certified, as indicated in each Test Report.

Product Description

The Alpha is a factory configurable modular switch mode power supply intended for building in to host equipment. The range covers the following: Alpha 400, Alpha 600, Alpha 800 (or Alpha 1000) and Alpha 1500 (there are non-standard variations to all ranges).

Model Differences

Alpha 400 is identical to the Alpha 400W, MA400, CA400, Alpha-400, Alpha-400W, MA-400 and CA-400. The Alpha 400 has a single forward converter with 5 output slots for a maximum of 5 modules. Cooling is provided by a single fan. Alpha 400 Series has a 400 W maximum output.

Alpha 600 is identical to the CA600, Alpha 600W, Alpha-600 and CA-600. The Alpha 600 has a single forward converter with 5 output slots for a maximum of 5 modules. Cooling is provided by a single fan. Alpha 600 Series has a 600 W maximum output.

Alpha 800 is identical to the Alpha 800W and CA800. Alpha 1000 is identical to the Alpha 1000W and CA1000. The Alpha 800/Alpha 1000 are electrically and mechanically identical with different ratings. These psu's have two forward converters with 7 output slots with up to 7 output modules. Cooling is provided by two fans. Alpha 800 Series has a 800 W maximum output and the Alpha 1000 Series has a 1000 W maximum output

Alpha 1500 and Alpha 1500W are identical to CA1500. These psu's have two forward converters with 8 output slots with up to 8 output modules. Cooling is provided by two fans.

Refer to enclosure 7-03 for ratings, loading conditions, module ratings table, secondary options, and other information.

Test Item Particulars

Product group	built-in component
Classification of use by	Skilled person
Supply Connection	AC Mains DC Mains

Supply tolerance	+10%/-10%
Supply connection – type	to be determined in End Product (mating connector)
Considered current rating of protective device	20 A; Location: building
Equipment mobility	for building-in
Over voltage category (OVC)	OVC II
Class of equipment	Class I
Special installation location	N/A
Pollution degree (PD)	PD 2
Manufacturer's specified Tma (°C)	50; 45 (for Alpha 1000 series only)
IP protection class	IPX0
Power systems	TN TT
Altitude during operation (m)	3000 m
Altitude of test laboratory (m)	64 m
Mass of equipment (kg)	max. 3.5

Technical Considerations

- The product was submitted and evaluated for use at the maximum ambient temperature (Tma) permitted by the manufacturer's specification of : 50°C, 45 (for Alpha 1000 series only - see CofA)
- The product is intended for use on the following power systems : TN, TT, DC mains supply
- Considered current rating of protective device as part of the building installation (A) : 20
- Mains supply tolerance (%) or absolute mains supply : +10%/-10%
- The equipment disconnect device is considered to be : Appliance inlet for models equipped with one, or evaluated in End Product for models with spade or screw connectors.
- The following were investigated as part of the protective earthing/bonding : Printed wiring board trace (refer to Enclosure - Schematics + PWB for layouts)
- The Risk Group of a lamp or lamp system (including LEDs) is : Exempt
- The following are available from the Applicant upon request : Installation (Safety) Instructions / Manual, also in languages other than English, including French language for Canadian national difference.
- Components have been evaluated for compliance to IEC or national standards. It shall be noted that provision of clause 4.1.1 was considered for components and subassemblies complying with IEC 60950-1 or IEC 60065 used as part of equipment covered by this standard without further evaluation other than to give consideration to the appropriate use of the component or subassembly in the end-product. Additional certificates may be required at the discretion of the accepting NCB or local authorities.

Engineering Conditions of Acceptability

For use only in or with complete equipment where the acceptability of the combination is determined by UL LLC. When installed in an end-product, consideration must be given to the following:

- The following product-line tests are conducted for this product : Earthing Continuity, Electric Strength
- The following output circuits are at ES1 energy levels : All outputs (also refer to module description on Enclosure 7-03, section "Energy source levels and outputs connected in series")
- The following output circuits are at ES2 energy levels : Modules with greater than 3 turn secondary's with unearthed output/s (also refer to module description on Enclosure 7-03, section "Energy source levels and outputs connected in series")
- The following output circuits are at PS3 energy levels : All outputs (by declaration)
- The maximum investigated branch circuit rating is : 20 A
- The investigated Pollution Degree is : 2
- Proper bonding to the end-product main protective earthing termination is : Required
- An investigation of the protective bonding terminals has : been conducted
- The following input terminals/connectors must be connected to the end-product supply neutral : "N"
- The following end-product enclosures are required : Electrical, Fire, Mechanical
- The following magnetic devices (e.g. transformers or inductor) are provided with an OBJY2 insulation system with the indicated rating greater than Class A (105°C) : Alpha 400: T205 (Class F); , Alpha 600: T203 (Class F); , Alpha 800/1000: T202 (Class F), T302 (Class F), T4/T1 (Class F or Class A optional – refer to CCL); , Alpha 1500: T202 (Class F), T302 (Class F);
- The following components require special consideration during end-product Thermal (Heating) tests due to the indicated maximum temperature measurements during component-level testing : X Capacitors (100°C), Electrolytic Capacitors (105°C), Chokes (130°C), TRX (130°C), Optocouplers (100°C), PCB (130°C)
- The equipment is suitable for direct connection to : AC mains supply,; DC mains supply for models with DC input rating.
- The power supply was evaluated to be used at altitudes up to : 3000m
- The end-product Electric Strength Test for the Alpha 400 is to be based upon a maximum working voltage of : Primary – Earthed Dead Metal: 291 Vrms / 400 Vpk, Primary-Secondary: 336 Vrms /864 Vpk
- The end-product Electric Strength Test for the Alpha 600 is to be based upon a maximum working voltage of : Primary – Earthed Dead Metal: 380 Vrms / 412 Vpk, Primary-Secondary: 406 Vrms / 728 Vpk
- The end-product Electric Strength Test for the Alpha 800/1000 is to be based upon a maximum working voltage of : Primary – Earthed Dead Metal: 360 Vrms / 384 Vpk, Primary-Secondary: 377 Vrms / 824Vpk
- The end-product Electric Strength Test for the Alpha 1500 is to be based upon a maximum working voltage of : Primary – Earthed Dead Metal: 284 Vrms / 384 Vpk, Primary-Secondary: 330 Vrms / 652 Vpk
- For Alpha 1000 series, where the specified Tma is 45°C, an elevated Tma (for example 50°C) can be considered and evaluated in the end use application allowing for specific load conditions.

Additional Information

Reissue 1:
This report is a reissue of CBTR Reference Number E135494-A6024-CB-1 issued on 2022-11-15 with CB Test Certificate Ref. DK-105070-M1-UL with the following changes:
- test report updated to the latest edition of the standard IEC 62368-1:2018
Based on the previously conducted testing and the review of product technical documentation including photos, schematics, wiring diagrams and similar, has been determined that the product continues to comply with the standard.

Project No. 4790099713: The following tests were selected as representative of the test program applicable to model covered by this CBTR: Normal Operating Conditions Temperature Measurement (Cl. B.2.6), Simulated

Abnormal Operating Conditions (B.3), and Electric Strength (Cl. 5.4.9). These tests have been witnessed for models selected as representative of the standard covered by this report and the applicable test program.

(UL Project 4790521043_11-2022) The following tests were selected as representative of the test program applicable to model covered by this CBTR: Operating temperature measurement conditions (Cl. B.2.6), Simulated Abnormal Operating Conditions (B.3), and Electric Strength (Cl. 5.4.9).
These tests have been witnessed for models selected as representative of the standard covered by this report and the applicable test program.

The marking label provided is representative of all models.

The main transformers for this product (T205 Alpha 400, T203 Alpha 600, T202 & T302 Alpha 800/1000 and 1500) do not have an overall part number as some parts are listed in the bill of materials for the forward converters (primary windings, cores etc.) and others are listed in the bill of materials for individual modules (secondary's).

Additional Standards

The product fulfills the requirements of: EN IEC 62368-1:2020+A11:2020, CSA/UL 62368-1:2019

Markings and Instructions

Clause Title	Marking or Instruction Details
Equipment identification marking – Manufacturer identification	Listee's or Recognized Company's name, Trade Name, Trademark or File Number
Equipment identification marking – model identification	Model Number
Equipment rating marking – ratings	"Input Ratings (voltage, frequency/dc, current/power)", "Output Ratings (voltage, frequency/dc, current/power)"

Special Instructions to UL Representative

Sub-assemblies built at TRIO Engineering Co. Ltd. are to be constructed in accordance with this Follow-Up Service Procedure. Sub-assemblies sent to final assembly locations shall be marked with a yellow dot. This identification code is to indicate to the field representative at the final assembly locations that the sub-assemblies were inspected in TRIO Engineering Co. Ltd. If variations are found, the code shall be removed by the manufacturer.